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Allis-Chalmers
Manufacturing Company

Bulletin 1448-A Crushing and Cement Machinery Department Reprint June, 1922

Gates Rock and Ore Crusher
STYLE "K"

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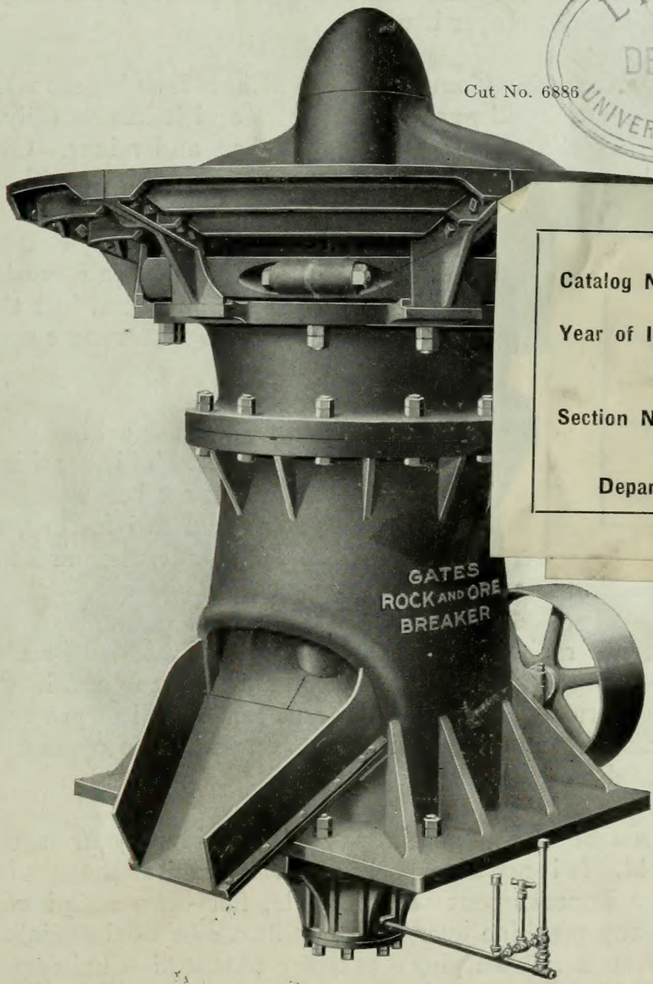

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Gates Rock and Ore Breaker

THE HISTORY of the Gates Gyratory Breaker for rock and ore begins with the introduction of the gyrator principle into rock breaking. Prior to that time the jaw crusher was the only type of machine known for reducing rock. Now the jaw crusher is used only where small amounts of material are to be handled and the gyratory breaker has almost entirely supplanted it as the standard type of heavy crushing machine for handling large quantities of rock or ore. The introduction of the gyratory breaker marks the beginning of the greater development that has taken place in the use of crushed stone for road building, concrete making and ballasting, and the great increase in the amount of ore produced. This has been brought about by the large saving in cost of breaking when the gyratory breaker is used.

Allis-Chalmers Manufacturing Company, or the Gates Iron Works which it absorbed, was the first manufacturer to build gyratory breakers and it has steadily developed this type of apparatus to meet the needs of the quarryman and miner. Over 7,000 Gates Breakers have been sold and these are in use in all parts of the world. That they are giving absolute satisfaction is evidenced by the constant receipt of new orders from old customers who are increasing the capacity of their plants. The Gates Breakers first built by the Company were of much larger capacity than the jaw crushers which they supplanted and were adequate to the demands made upon them, but their unqualified success led to such an increase in the use of rock breakers that there came a need for breakers having capacities far beyohd those of the earlier types.

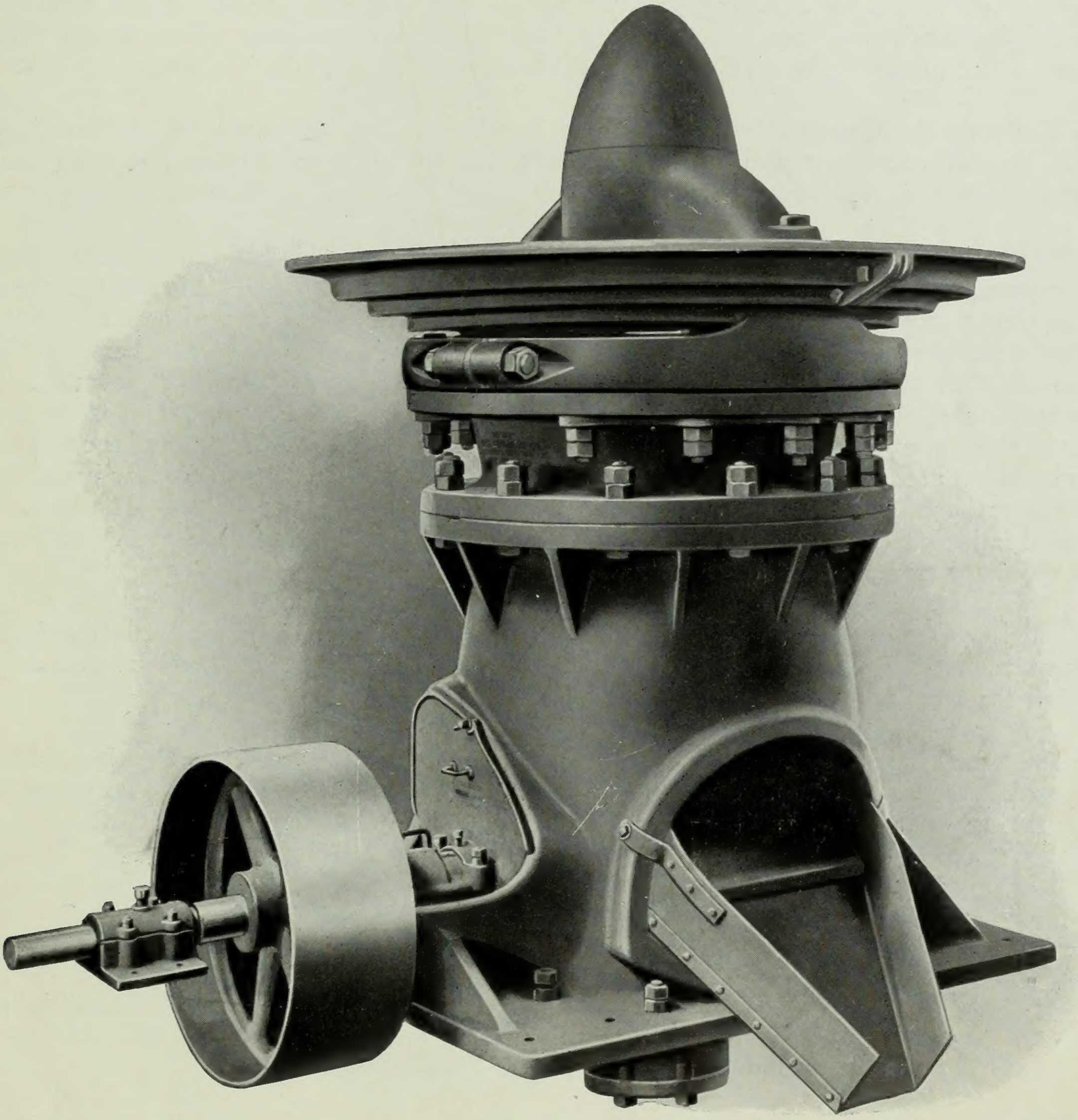
The following pages illustrate and describe the latest machine designated as the Style "K" Breaker to distinguish it from the other types. This machine embodies the experience of years of building and observation. Each part has been carefully studied and where forms used in the earlier breakers have proved satisfactory, they have been embodied in the new design. Where changes have been made, the parts have been tested by several years of service and have proved their fitness.

The Style "K" Gates Breaker is adapted to reduce all kinds of rock under all conditions. It has a greater capacity than any other breaker made and is not liable to clog in feeding. It is stronger, runs more smoothly, and consumes less power per ton of rock broken than other breaker ever built. It is more convenient to operate and the cost of its maintenance is reduced to the lowest possible limit.

The first of these machines was put into operation eleven years ago and since then thousands have been sold. It is not an experiment, as no radical changes have been made, but every detail, where improvement was possible, has been redesigned to make the Style "K" superior to any machine ever before built. The testimonials from the users of this machine are of such a gratifying character that Allis-Chalmers Manufacturing Company feels warranted in making each of the claims herein presented.

Crushe

Plate 6885



Style "K" Left-Hand, Right Angle Driven Gates Rock and Ore Breaker
(Front View)

GENERAL DESCRIPTION

The heavy outer shell of the Gates Breaker is somewhat like an hour-glass in shape. It is open at the top for receiving rock and has a spout inclined from one side of its lower lobe for discharging. From just below the mouth down to the place of the smallest diameter is the throat of the machine, where the actual rock breaking is accomplished.

The main shaft, suspended from great spiderarms that span the top of the opening, passes through the throat and has keyed to it at that point a massive conelike head, free to move within the throat walls, which are reinforced for wear.

The action of the head is somewhat peculiar, as it has a circular and rolling movement, and approaches successively every point of the interior of the throat. This is accomplished by causing a movement of the lower end of the axis of the shaft around a small circle, the universal character of the spider journal at the top making this possible; consequently the axis of the main shaft is always slightly inclined to the true vertical axis of the machine. This action results in a continuous breaking of material which then drops through at the point of the throat from which the head is most distant. The concave shape of the throat permits the material to be in contact only at its edges. This results in a clear break of the rock rather than crushing, so that the product is nearly cubical in form. The broken material falls on to an inclined diaphragm which protects the eccentric and gear. Passing over the diaphragm, it discharges at the spout by gravity.

The lower end of the shaft passes through a sleeve which is bored off center one-half the required gyration. The shaft is driven by a gear on the sleeve which receives its power through the band wheel.

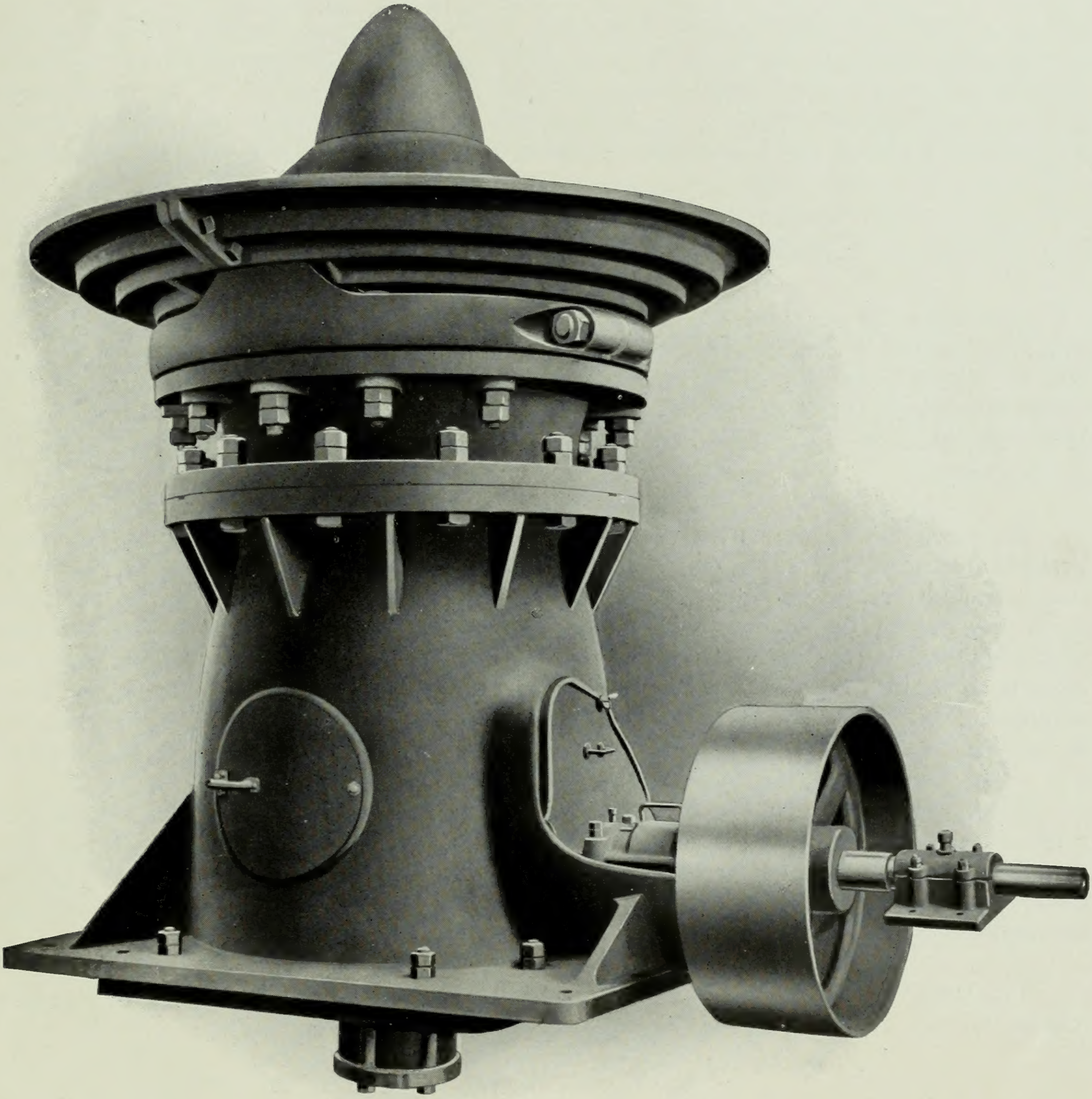
The main shaft is adjustable and can be raised or lowered to regulate the size of the opening between concaves and head. This provides for altering the size of the product or for taking up the wear and keeping the product uniform.

RIGHT ANGLE DRIVEN GATES BREAKERS

Style "K" Breakers are so constructed as to permit of their being driven at right angles to the discharge opening of the machine when this is necessary or desirable, as may be seen by the illustrations on pages 3 and 5.

The advantages derived from this improvement are numerous. Where a very compact arrangement of the machinery in a plant is desired and where more than one breaker discharges into one elevator, the desirability of the arrangement is obvious. It does away with bevel gears, special countershafts and other transmitting machinery and permits, in many cases, of the machine being belted direct from the engine or main line shaft. The elimination of complicated transmission machinery will, of course, effect a saving in the cost of the installation as well as in the economy of operation. In many cases the

Plate 6884



Style "K" Left-Hand, Right Angle Driven Gates Rock and Ore Breaker
(Rear View)

elevator and screen can be driven from the countershaft of this breaker without the use of bevel gears, by simply mounting a pulley on the projecting end of it.

If a purchaser should prefer this type to the regular or straight-driven machine illustrated on page 1, he should state in ordering upon which side of this machine he desires to have the band wheel placed, whether to the right or left of the breaker, the position being determined from the point where one would stand to look into the spout. Plate 6885, on page 3, and plate 6884, on page 5, fully illustrate the arrangement in question.

LARGE GATES ROCK AND ORE BREAKERS

The desire to economize in labor and the use of explosives in preparing rock for breakers created a demand for breakers having larger receiving openings than the size No. 8. The introduction of the steam shovel in quarry work made it possible to convey to the breaker masses of ore and rock entirely beyond the limits of hand labor and, unless larger machines were supplied, this material would have to be broken before being fed to the crusher.

To meet this demand for larger breakers, Allis-Chalmers Manufacturing Company brought out its No. 9, which was designed primarily for the breaking up of the northern iron ores and certain grades of trap rock. This machine has been followed by others up to No. 27, which has an opening of 54 inches between the head and concaves. The material of the Minnesota Iron Mines closely approaches pig iron on hardness and these machines have been built to handle it without excessive wear or breakage. In developing these machines each part of the breaker has been designed to perform the very heavy service for which it is intended, thereby obtaining the maximum possible strength and rigidity.

The larger breakers are not intended for finishing machines to reduce rock to such a size that it may be used for commercial purposes without recrushing (except for blast furnace flux where a large product may be used), but are intended for sledges to eliminate, as far as possible, reblasting in the quarries. It is intended that these breakers be followed by smaller machines for further reduction of the rock.

The larger of these breakers are described in detail in Bulletin 1441, but their general characteristics are the same as the breakers described in this bulletin.

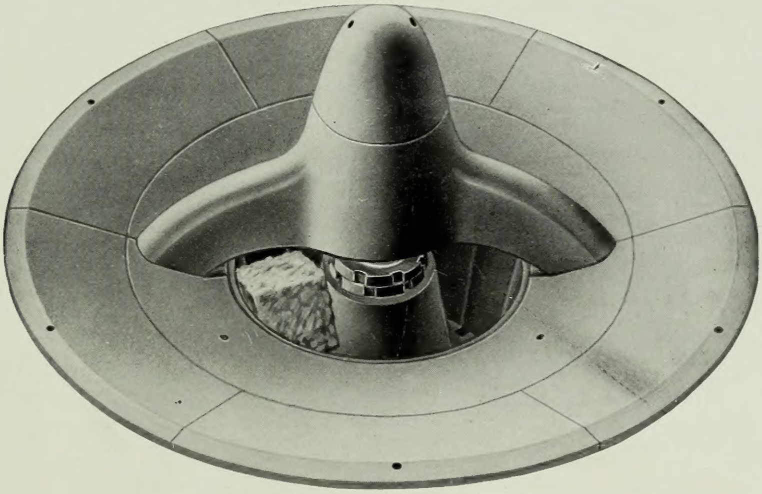
SPIDER

The design of the spider of the Style "K" Breaker is a very important improvement over that used heretofore on any breaker of any make. It can be seen from the sectional view shown on page 19, plate 4940, that the new form is that of a true spider, with its two or more arms arched widely over the top of the head and concaves, leaving large spaces on either side and underneath. Any piece of stone that will pass into the space between the head and the concaves will also pass under the arms of the spider. By examining the view below, it may be noted that the spider of this crusher is in reality a spider, having no ring covering up a part of the opening and thus tending to retard the feeding. This free opening prevents any bridging of the stone when dumped from cars into the hopper. It is apparent that if stone, of any size which can be got into the mouth of the breaker, can pass under the spider arms, and the entire feeding opening of the crusher may be more readily kept full at all times than when, by reason of the frequent bridging of the stone which occurs in older styles of breakers, the operations of the machine are delayed while the bridging is broken up. It is asserted by persons who use the Style "K" Breaker that this feature alone increases the feeding capacity of the machine from 15 to 20 per cent.

It will be noticed that the rock entering the breaker produces no wear on any part of the spider except the arms, and for these manganese steel shields can be furnished.

NOTE! For exceptionally heavy work Allis-Chalmers Manufacturing Company advises the use of, and is prepared to furnish, cast steel spiders and special heat-treated alloy steel shafts.

Plate 1437

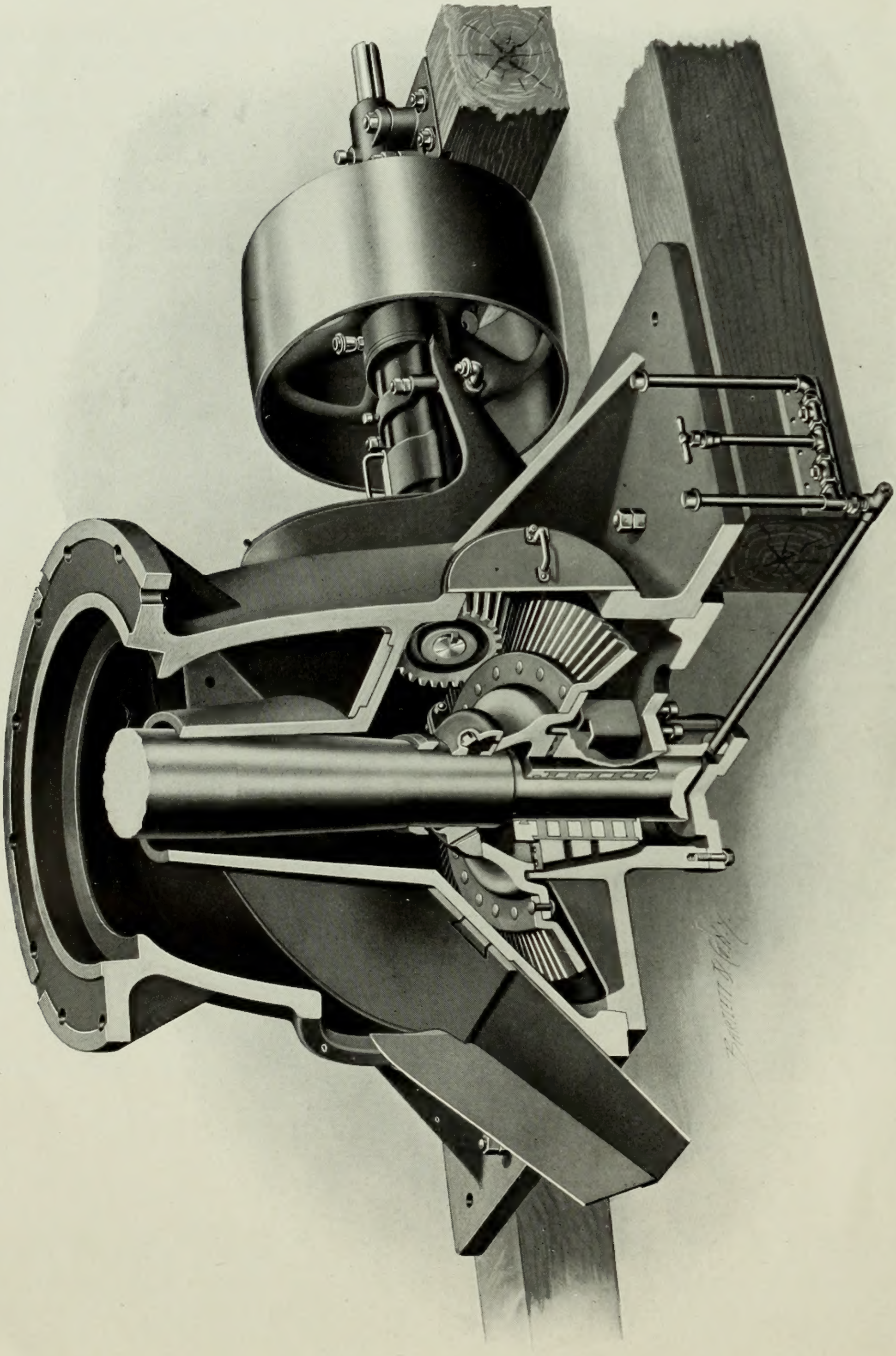


The Spider and Hopper

HOPPER

The hopper of the Style "K" breaker is made of cast iron and is heavily ribbeds In the larger sizes it is made sectional in such a way that in taking off the spider, it i- not necessary to remove anything else except the inner ring of the hopper. The arrange. ment of the hopper in relation to the concaves is a special feature in the construction

Plate 1623



Sectional View of Lower Parts of Style "K" Gates Rock and Ore Breakers, Showing Oiling Devices, Eccentric and Bevel Gear.

of the Style "K" Breaker. The hopper is so designed that its lower edge rests directly on the top of the shell near the upper ends of the concaves. Instead of the stone having to go through a rim on the spider, as in other styles of breakers, it spouts directly from the hopper into the opening between the head and the concaves. This arrangement enhances the feeding capacity of the machine materially, because breaking takes place at the very top of the opening and the tendency to clog is overcome. There is no motion of the rock at the mouths of other types of gyratory breakers and, if choked, the rock must either be lifted out of the deep opening or else broken with sledges. The height of the breaker from the foundation to the feeding floor is reduced somewhat by setting the hopper directly on the top of the shell.

TOP SHELL

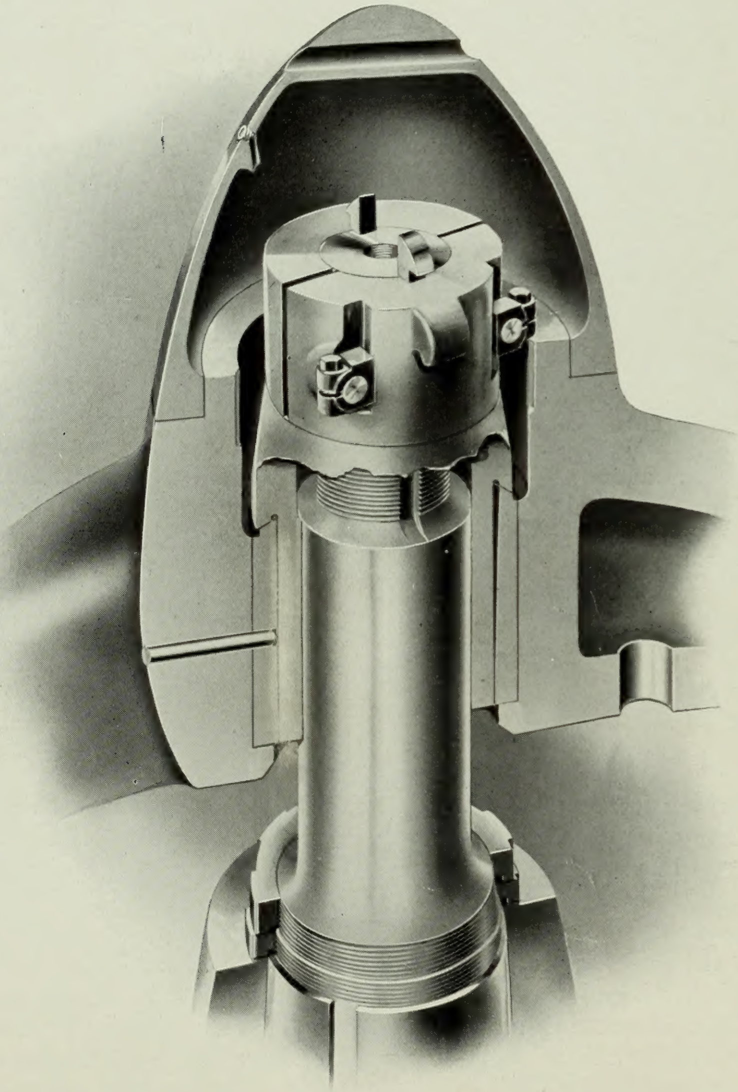
The top shell of the Style "K" Breaker is somewhat heavier than that of the previous styles. The bolt holes for bolting it to the bottom shell are made in groups of four spaced at equal distances apart so that, by turning the top shell, the spider can be set in several different positions to suit the feeding point or the side from which the stone is dumped into the hopper. The concaves can be changed without disturbing the spider or hopper, an impossibility with previous designs of breakers.

BOTTOM SHELL

The diaphragm is made with a considerably steeper angle than that used heretofore, thus insuring perfect discharge even with damp stone. The space between the head and the top of the diaphragm is nearly double that in the older styles and gives ample room for slabby stone to get out without clogging. Chilled iron wearing plates are fitted to cover the entire surface of the diaphragm. A manhole, which stands at right angles to the opening through which the countershaft runs, is provided in the side of the bottom shell, making it convenient for the operator to get at the gears and eccentric while the machine is working and without exposing himself to the running belt. This opening is covered with a light steel door, easily removable. The opening over the countershaft through which the pinion is passed is covered with a light cast iron door to keep out stone and dust from the gears and eccentric.

The base of the bottom shell is extended to rest on the foundation and to permit of the bottom plate being dropped. The counterhsaft bearing is cast integral with the shell and is machined so that the babbitting mandrel is self-aligning. A lack of proper arrangements in other breakers for bringing the teeth of the gear into correct mesh accounts for many breakdowns.

Plate 4872



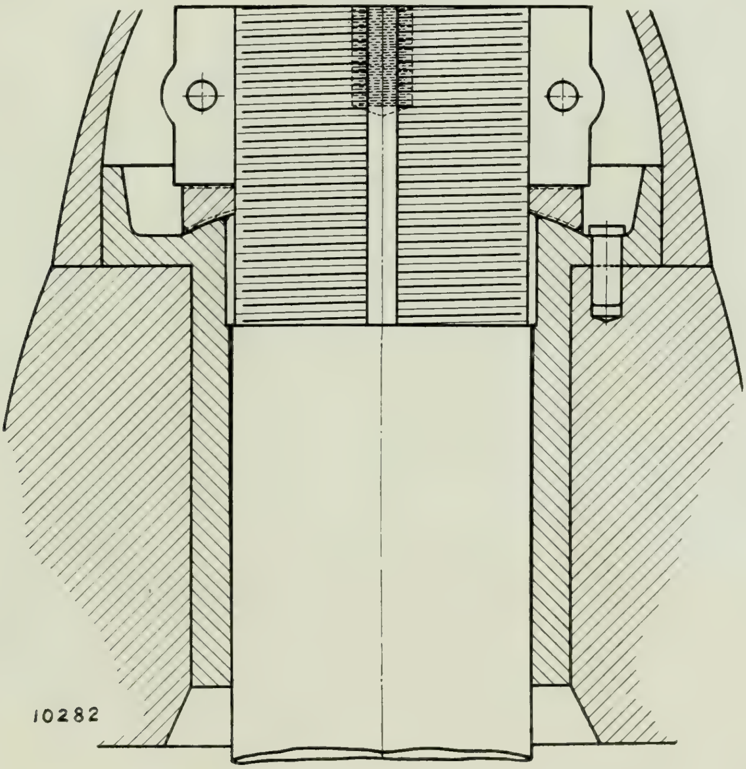
Head of Main Shaft Showing Method and Devices for Adjustment.
Construction used on Breakers up to No. 8.

MAIN SHAFT AND ADJUSTMENT

The main shaft of the Style "K" Breaker is made heavier and considerably stronger than in the earlier styles, and is suspended from the top instead of being supported from the bottom as in Style "D". This provides for a greater range of adjustment for the head, thus increasing the wearing longevity of the head and concaves of nearly 100 per cent. The adjusting is done at the top instead of at the bottom, which is a great convenience. Plate 4872, on page 10, shows the suspension device drawn to a large scale.

The shaft is suspended by means of a bushing which is slipped over the upper end of the shaft and has a projecting flange that rests on a bushing in the spider hub.

Plate 10282



Style of Suspension for Large Breakers.
(Patented)

Construction used on Breakers above No. 7½.

This shaft bushing is held in place on the shaft by a nut formed in two parts and clamped together by two bolts which secure it to the threaded upper end of the shaft; the lower side of the nut rests on the upper part of the shaft bushing. The top of the spider bushing and the lower part of the flange on the shaft bushing are machined in the form of a portion of a sphere, whose center is the fulcrum point of the suspension. This mades an absolutely correct suspension, as the weight of the shaft is carried on practically the entire surface of the flange at all times. This method of suspension greatly facilitates proper oiling of the bearing. The well, formed by the portion of the spider above the bushing, may be filled with oil, thus keeping the suspension bearing constantly flooded without any leakage or appreciable loss. Oil may be introduced through a hole in the dust cap and the dust cap need not be removed except when making adjustments.

BOTTOM PLATE

The bottom plate is a simple and strong casting easily removable so that the gear and eccentric can be taken out. Large oil passages are cast in the hub for the rapid and free circulation of oil for the eccentric bearing. Arrangements are also provided for draining the oil chambers and for conducting the oil that overflows to receptacles. A pump is furnished to force the fresh oil into the passages. To insure that they shall be full before starting the machine, pumping should be continued until oil overflows from the rim around the hub into the drain. As the overflow level is some distance above the brass wearing ring, all bearing surfaces are continually submerged in oil so long as the overflow is kept up.

Oil circulation is induced by the capillary attraction for the oil of both the eccentric and the main shaft journals. Two large oil holes are cast in the top of the eccentric to allow the oil that rises from the main shaft journal to flow through them back to the reservoir underneath the shaft. The oil coming up the eccentric journal must pass the brass wearing ring and, in so doing, thoroughly flushes it before it reaches the passages to the reservoir. Because of these provisions, and also because of the large bearing surfaces and the high quality of the babbitt metal used, the eccentric works under most favorable conditions for continuous service in spite of the hard labor demanded of it. It will invariably run cool if a little fresh oil be added two or three times a day to replace that worn out.

The simplicity and efficacy of this oiling device accounts for the unqualified success of the thousands of machines that are fitted with it.

If desirable the bevel gear may be run in oil but, in any event, the teeth should be kept well greased. Special provision has been made for the oiling independent of the eccentric lubricating system.

CONCAVES

Special chilled iron is used for the concaves for ordinary work and manganese steel for hard rock. The steel concaves are paneled out on the back so as to reduce to a minimum the wastage of the metal. As the upper ends of the concaves are not subjected to as severe service as the lower ends, all sizes of machines can be furnished, if the purchaser so desires and specifies, with sectional concaves so that the upper and heavier part need be replaced less often, which makes a material saving in repairs. A cast iron ring is used to support the concaves and if, through carelessness, the ring is worn away it can be readily replaced. In all other breakers the concaves are set on top of the bottom shell and it becomes troublesome to reset them when the shell is worn. The lower ends of the concaves are beveled to reinforce the crushing point. This insures a uniform product and increases the life of the concaves.

COUNTERSHAFT

The countershaft of the Style "K" Breaker is liberal in diameter and will not deflect under the strains coming upon it. It is supplied with an outboard bearing which takes the pull of the belt when the drive is not ideal. Although not needed in all cases, this bearing is included with each machine to guard against possible trouble. The bearing is dust-proof and will not leak oil. A large reservoir is cast under the journals and the oil is lifted from this by two chains. It is then spread along the top of the shaft, thoroughly lubricating it, and is finally spouted to the settling chamber through a passage in the bottom of the bearing.

OIL BONNET AND DUST RING

The dust ring is made in halves which are bolted together. It can be replaced without dismantling the machine. This ring keeps practically all dust from the gear chamber but, on account of slight wear, some dirt will find its way down the shaft. In order to prevent this from getting into the eccentric journal, an oil bonnet is used. This is also made in halves and rests on top of the eccentric. A collar shrunk upon the main shaft directly over the bonnet deflects dust and grit from the joint between the shaft and bonnet. The bonnet is free to rotate either with the eccentric or with the shaft and, as its relative position on the eccentric is not changed, the wear is very slight.

Before starting the breaker a little oil should be run down the hole communicating with the top of the eccentric. The object of this is to oil or coat the upper end of the shaft journal and thereby assist the circulation while the oil is warming up.

The improvement made on these parts of the breaker add to the longevity of the machine, besides effecting a marked saving in oil.

ECCENTRIC AND BEVEL GEAR

In this latest style of breaker the eccentric has been strengthened and the bearing surfaces have been increased. The pressure is resisted by linings of special babbitt metal. It took years of careful study and observation to determine the proper composition for this, because the conditions under which this bearing operates are peculiar.

The weight of the eccentric and gear is carried on a brass wearing ring and the gear is fastened to the eccentric by means of rivets, the same as in previous styles. This construction was so successful that no alterations were required.

The gear is extra large and the teeth are shaped so that slight variations in their meshing, due to wear of bearings, will not affect its proper running with the pinion.

HEAD

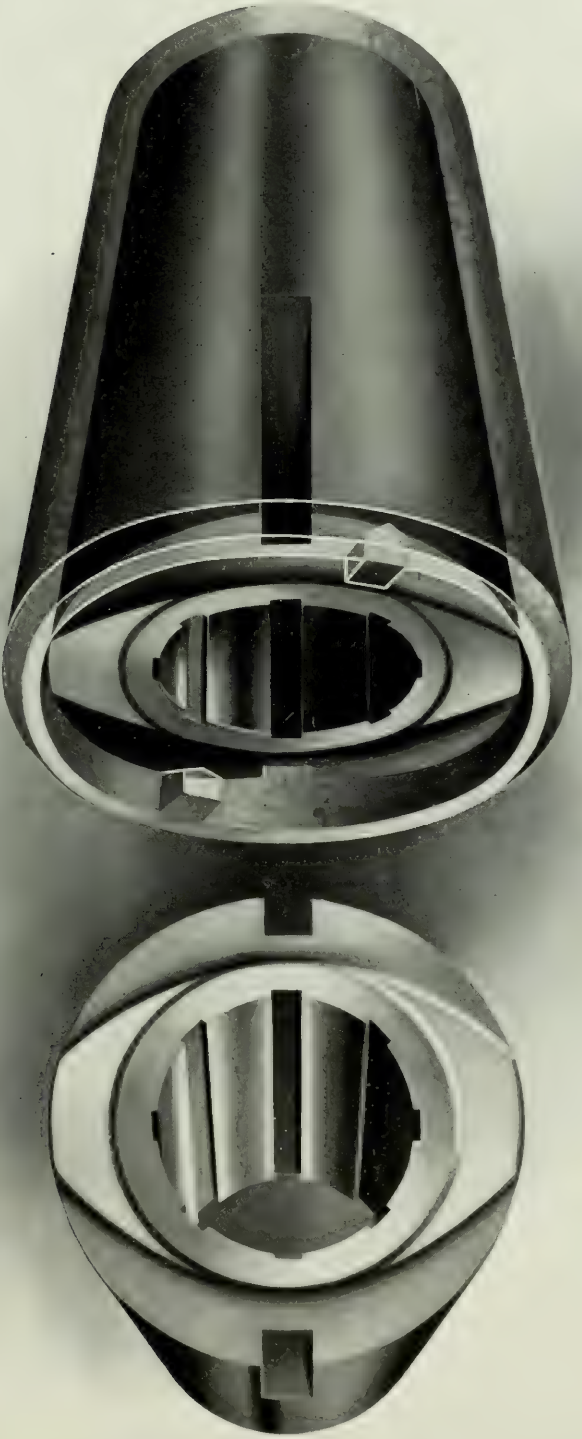
The crushing head is bored full length to fit the shaft and is kept from turning by zinc keys. Zinc is used for keys instead of steel as in other makes of breakers, owing to the fact that zinc will not rust and because no skill is required to fit in place keys made of this metal, as it is melted and poured in the keyseats. The head is held down on the shaft by ring nuts. For ordinary limestone and soft rock breaking, the head is made of special chilled iron. For breaking granite, trap rock and other very hard materials, the head is required to be of extra strength and hardness. Heads or mantles of manganese steel are used for this work.

Owing to the higher price of manganese steel over that of chilled iron and also to overcome difficulties due to the expansion of manganese steel metal when the heads are subjected to severe service, it has been found more economical and practical to use the patented gunlock mantle shown on page 15, Plate 1624, instead of a solid manganese steel head. A brief description of this mantle follows.

The core or head center is fastened to the shaft in a manner similar to that used for the solid chilled iron head. It is made of cast iron and the lower edge is fashioned into two double spirals, the highest points of which run into two slots in the sides of the core. The mantle is made of manganese steel and is fitted with two lugs at its lower end. The inside of the mantle is machined to perfectly fit the head center so that it can turn upon it.

After the mantle is slipped over the core, with the lugs passing through the slots, it is twisted slightly to make the lugs engage the spiral surfaces and thus draw the mantle firmly down on the head center. Any looseness of the mantle which develops as a result of the expansion and strainings of the metal is immediately and automatically taken up by the creeping of the shell on the core. The spirals are made with right and left threads, so that the breaker can be run in either direction. The invention of this device has solved one of the hardest problems found in reducing tough and hard rock.

Plate 1024



Manganese Steel Mantle and Head Center.
(Patented)

MATERIAL

Allis-Chalmers Manufacturing Company uses special mixtures of iron to make the castings strong, hard and tough and free from blow-holes. As each part of the breaker requires its own peculiar mixtures, a laboratory in charge of an expert chemist is operated in connection with the foundry. All pig and wrought iron, coke, steel, copper, tin, zinc and oil are subjected to chemical and physical tests. The mixtures and alloys are also tested and analyzed to check up the proportions of the compositions, and records are kept of each heat for future reference. These tests make it possible to maintain the mixtures at their highest strength.

All parts of the breaker are made to gauges and templets to insure the accurate fit of duplicate parts. As the trade in Gates Breakers is so extensive, a stock of finished duplicate parts and completed machines is constantly kept on hand to enable deliveries to be made promptly. A complete record is kept of each machine and all repairs are entered. When an order for repair parts is received it is compared with the record to minimize the chance of error in filling it.

The general outlines of the "K" machines, together with their foundations, are shown on pages 20 to 23.

Masonry foundations are preferable on account of the absence of shrinkage, but very often a timber foundation will be more suitable. The dimensions for the foundations given in this bulletin are only preliminary and special blue prints should be obtained for construction.

In all cases it is advisable to confer with a representative of Allis-Chalmers Manufacturing Company or write to the home office for suggestions in arranging the machinery. A staff of engineers is available to study out the best plan for each particular case and drawings of the foundation will be furnished free of charge to the purchaser of a breaker.

GATES BREAKER OIL

It is of the utmost importance that good oil should always be used on breakers, as more than one-half the repairs are attributed to the use of poor oil. Allis-Chalmers Manufacturing Company recommends an oil which it knows to be right and earnestly solicits its use in preference to all others.

INFORMATION TO GIVE WHEN ORDERING BREAKERS

It is absolutely essential that the nature of the material to be broken be described.

State the kind of concaves and head desired, whether of chilled iron or manganese steel. In order that the breaker may be fitted with the proper concaves and head, it is necessary to give the size of the product the machine is to make. The term "Size of Product" means the size of the round hole through which may be passed, by hand, 85 or 90% of the stone reduced by the breaker with the head in its lowest position.

It should also be stated whether the foundation is to be masonry or timber so that proper prints may be forwarded and work on the foundations be conducted while the breaker is being built and shipped.

If a right angle machine is desired, state on which side the pulley is to be placed, whether to the right or left of the breaker when looking into the spout. If nothing is stated, the regular machine will be sent, with the pulley at the rear of the machine opposite the spout.

The style "K" Breakers as regularly furnished will, unless otherwise specified, include foundation bolts for timber or masonry foundations, as the customer may desire, a babbitting mandrel for the countershaft, a set of babbitting sleeves for the eccentric outboard bearing, oil pump and pipe, lowering rods for the bottom plate, a complete set of wrenches, and sufficient Gates Breaker Oil for use when starting the breaker.

SIZE OF MATERIAL PRODUCED

The size of broken or crushed stone is designated by different names, such as "2½-inch ring," "3-inch stone," 1-inch product," etc. This Company has adopted the first term, namely, "ring" and means thereby all the stone coming from the breaker which can be passed (by hand) through a ring of the designated size.

It is aimed to furnish heads of such size and concaves of such thickness that 85% or 90% of crushed material will pass the specified ring when the breaker head is in its lowest position. The 10% to 15% which is not small enough to be put through the ring by hand, represents the majority of the flat or irregular pieces, sometimes called "spalls," but termed "rejections" by this Company.

Allis-Chalmers Manufacturing Company does not guarantee these precentages as the cleavage of different kinds of material govern this, but it uses its best judgment, gained by a very long and extensive experience. Should the material not be of satisfactory size, the head, or concaves, or both, can be changed until proper sized material results.

Books of "Instructions for Setting and Operating Gates Breakers" give full information in regard to all matters connected with operating Gates Breakers and one is sent out with each shipment of these machines.

Larger perforations are used in the section of screens than the respective size "ring" material called for, as material which has passed a given sized perforation in a moving screen will pass a somewhat smaller ring held in the hand. Therefore, if your contract specifies that the material must pass certain sizes of screen perforation, a statement should be made of this, and the Company will undertake to adjust the breaker to these conditions, according to its best judgment.

INFORMATION TO BE GIVEN WHEN ORDERING REPAIR PARTS FOR GATES BREAKERS

It is absolutely necessary to give the sale number which may be found on the machine.

Give the names and, where stated, the reference numbers of the parts required. These can be found on page 19.

If the size of the product is required to be changed and new concaves are ordered, state the new size of stone which the machine is to make.

BABBITT METAL

Nothing but the very highest grade of babbitt metal should be used in repairing the eccentric of the breaker as, otherwise, trouble is bound to ensue through the machine becoming heated at this point. On account of the difficulty experienced in obtaining the proper grade in the open market, it is advisable to order the special brand of babbitt manufactured by Allis-Chalmers Manufacturing Company for this work.

SLAB ZINC

Zinc is used for backing the concaves and for holding the head to the main shaft. When the concaves are changed, it is necessary to add some new metal to replenish the loss in handling and remelting and, for this reason, it is well to order a supply with new concaves.

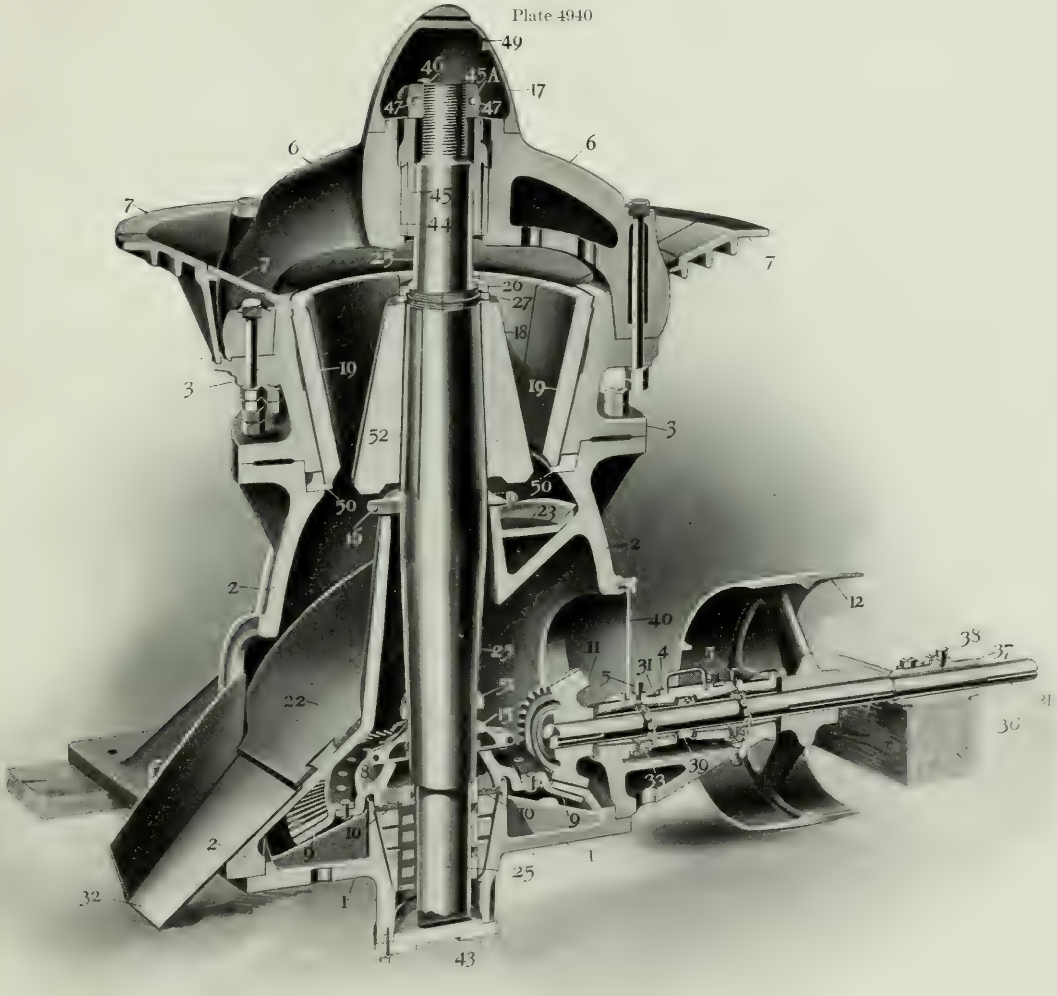
DIMENSIONS, WEIGHTS, CAPACITIES AND REQUIRED POWER
STYLE "K"

Size	Dimensions of Each Receiving Opening About	Weight of Breaker	Capacity per Hour, Based on Limestone in Tons of 2000 Pounds, to Pass through a Ring of								Smallest Size of Product of Machine	Dimensions of Driving Pulley	Revolutions of Driving Pulley	Horse Power Required
	Inches	Pounds	1½	1¾	2	2½	3	3½	4	5	Inches	Inches		
4	8 x 30	22,000	15	20	25	30	40	......	......	.....	1½	32 x 12	400	14 to 21
5	10 x 38	32,800	......	30	40	50	60	70	......	.....	1¾	36 x 14	375	22 to 30
6	12 x 44	48,000	......	......	50	70	80	90	......	.....	2	40 x 16	350	28 to 45
7½	14 x 52	68,100	......	......	......	80	90	100	120	.....	2½	44 x 19	350	50 to 75
8	18 x 68	103,000	......	......	......	......	......	130	150	.....	3½	48 x 20	350	70 to 110
9	21 x 76	155,000	......	......	......	......	......	......	250	300	4	56 x 20	300	100 to 150
10	24 x 82	Information Furnished on Application												
12	27 x 88													
18	36 x 102													
21	42 x 114													
24	48 x 125													
27	54 x 141													

POWER—The estimate for power required is for Breakers only, no allowance having been made for Elevators or Screens.
NOTE:—Sizes smaller than No. 4 are not made in "K" style. For these sizes refer to Style "D" Bulletin.

STYLE "K" GATES BREAKER

Plate 4940



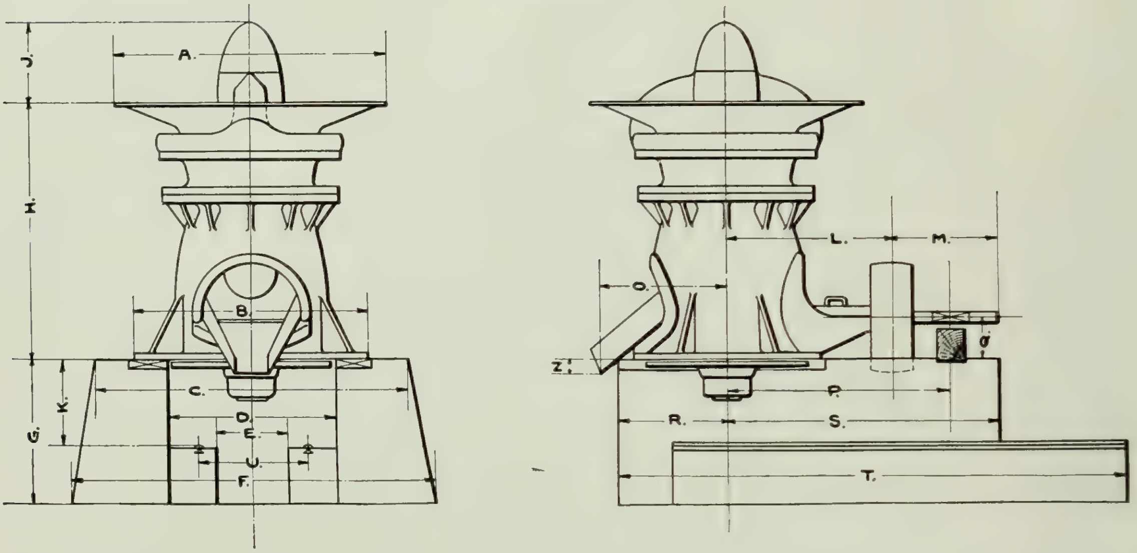
General Sectional View of Style "K" Gates Rock and Ore Breaker.

LIST OF PARTS FOR STYLE "K" GATES ROCK AND ORE BREAKER

1	Bottom Plate
2	Bottom Shell
3	Top Shell
4	Bearing Cap
5	Oil Nipple and Cap
6	Spider
7	Hopper
8	Eccentric
9	Bevel Wheel
10	Brass Wearing Ring
11	Bevel Pinion
12	Band Wheel
15	Oil Bonnet
16	Dust Ring
17	Dust Cap
*18	Head
19	Concaves
22	Wearing Plates
23	Upper Wearing Plate
25	Main Shaft
26	Upper Ring Nut
27	Lower Ring Nut
31	Countershaft
32	Spout
33	Oiling Chain
36	Outboard Bearing Base
37	Outboard Bearing Cap
38	Outboard Bearing Oil Nipple and Cap
39	Countershaft Collar
40	Dust Door
43	Bottom Plate Cover
44	Spider Bushing
45	Shaft Bushing
45A	Shaft Split Nut
46	Gib Key for Split Nut
47	Clamp Bolts for Split Nut
49	Oil Plug in Dust Cap
50	Concave Supporting Ring
51	Main Shaft Collar
52	Zinc Keys—poured in Place by Owner
	Key Concave
	Narrow Key Concave
	Babbitting Sleeves
	Babbitting Mandrel for Countershaft Bearing
	Side Dust Door
	Side Dust Door Handle
	Split Nut for Clamp Bolt
	Oil Feed and Drain Pipe
	Oil Pump
	Telltale Pipe for Eccentrict
	Filling Pipe
	Telltale Pipe for Countershaf
	Headcenter or Core Mantle

*For Manganese Steel Mantel and Head Center, see Page 15.

Plate 4902



STYLE "K" BREAKER—REGULAR DRIVE

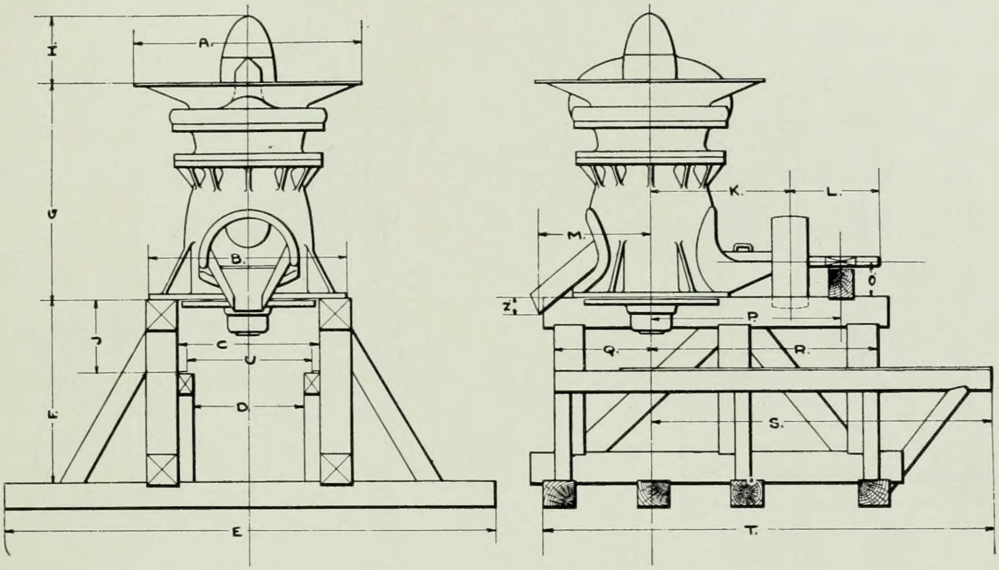
General Dimensions of Foundations—Mason Work.

REGULAR DRIVE—MASONRY

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	Pulley	Revs. Per Min.
	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	in.	ft. in.	ft. in.	ft. in.	ft. in.	in. in.	
4	6-8	5-9	8-0	4-0	20	8-10	3-3	6- 0	2- 2⅝	23½	4-2 15/16	2- 7⅜	5¼	2-11½	5- 9¼	12	2-4	7- 1	12-5	2-6	32 x 12	400
5	7-6	6-6	8-8	4-8	2- 0	10- 0	3-9	7- 0⅞	2- 4⅛	2- 4	4-6⅜	2- 8⅞	6¼	3- 6¼	6- 1¼	14⅛	3-0	7- 6	14-0	3-0	36 x 14	375
6	8-7	7-4	10-0	5-6	2-10	11- 4	4-3	8- 1½	3- 0½	2- 6½	4-10¾	2-10¾	7⅛	3- 9½	6- 7½	15⅛	3-4	7-10	15-2	4-0	40 x 16	350
7½	10-8	7-8½	10-8	6-2	3- 6	12- 2	5-0	8- 7⅛	2-11¾	2- 9	5-6⅛	3- 1⅞	10½	4- 4	7- 4	15½	3-6	8- 8	16-8	4-8	44 x 19	350
8	12-4	9-0	11-8	6-8	3-10	13- 8	6-0	10- 5⅛	3- 6¼	3- 3	5-9⅝	3- 6¼	7	4- 6	7-11	16½	4-0	9- 4	18-4	5-2	48 x 20	350
9	14-6	9-10	12-8	7-8	4- 8	15- 0	7-0	12-10	3-10	4- 0	6-6½	3- 8¼	9	5- 6	8- 6½	19 3/16	4-6	10- 0	20-0	6-0	56 x 20	300

NOTE—In all cases get special plan for foundation. The dimensions given on this page are only intended as a preliminary guide.

Plate 4899



STYLE "K" BREAKER—REGULAR DRIVE

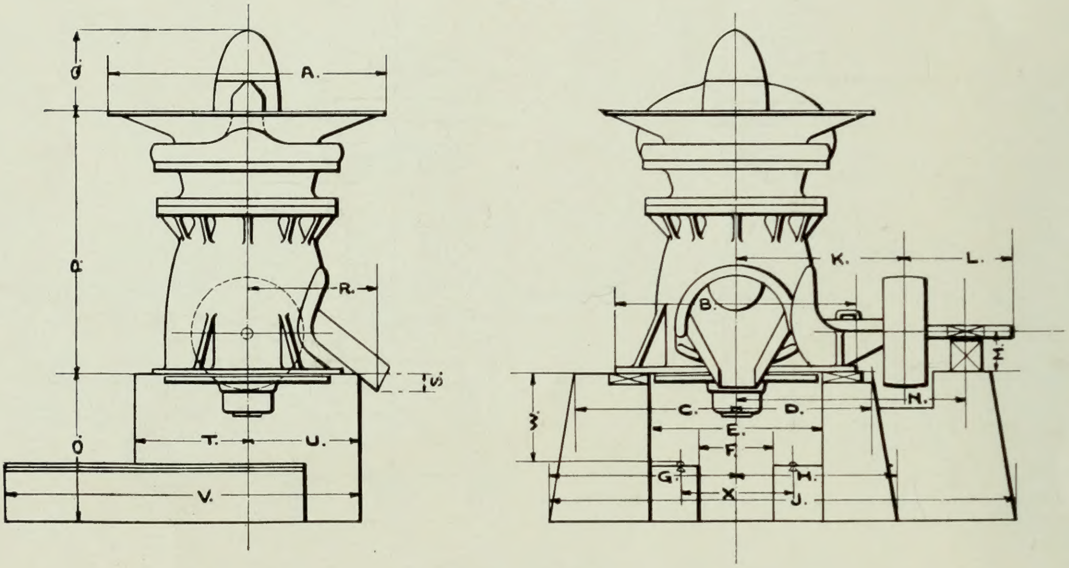
General Dimensions of Foundations—Timber Work.

REGULAR DRIVE—TIMBER

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	Pulley	Revs. Per Min.
	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft.in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	ft. in.	in.	in.	ft. in.	ft.in	ft.in.	ft. in.	ft.in.	ft.in.	in. in.	
4	6-8	5-9	4-0	3- 0	14-0	5-3	6-0	2- 2⅝	23½	4-2¹⁵⁄₁₆	2- 7⅜	2-11½	5¼	12	5- 9¼	2- 9	6- 9	9-11	13-2	3-6	32 x 12	400
5	7-6	6-6	4-8	3- 8	16-0	5-9	7-0⅞	2- 4⅛	2- 4	4-6⅜	2- 8⅞	3- 6¼	6¼	14⅛	6- 1¼	3- 2	7- 3	10-10	14-4	4-2	36 x 14	375
6	8-7	7-4	5-6	4- 6	16-0	6-3	8-1½	3- 0½	2- 6½	4-10¾	2-10¾	3- 9½	7⅛	15⅛	6- 7½	3- 6	7-10	12- 0	16-0	5-0	40 x 16	350
7½	10-8	7-8½	6-2	4-10	18-0	6-9	8-7⅛	2-11¾	2- 9	5-6⅛	3- 1⅞	4- 4	10½	15½	7- 4	3-11	8- 9	13- 1	17-4	5-0	44 x 19	350
8	12-4	9-0	6-8	5- 4	18-0	7-3	10-5⅛	3- 6¼	3- 3	5-9⅝	3- 6¼	4- 6	7	16½	7-11	4- 5	9- 4	14- 3	19-0	5-6	48 x 20	350

NOTE—In all cases get special plan for foundation. The dimensions given on this page are only intended as a preliminary guide.

Plate 4900



STYLE "K" BREAKER—RIGHT ANGLE DRIVE

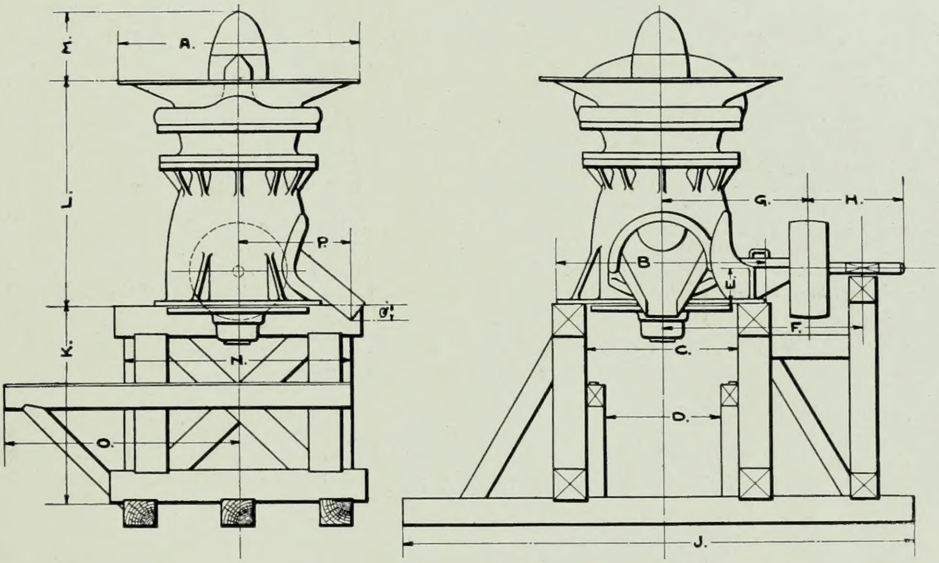
General Dimensions of Foundations—Mason Work.

RIGHT ANGLE DRIVE—MASONARY

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Pulley	Revs. Per Min.
	ft.in.	ft.in.	ft.in.	ft.in.	ft.in	ft.in.	ft.in.	ft.in.	ft.in.	ft. in.	ft. in.	in.	ft. in.	ft.in.	ft. in.	ft. in.	ft. in.	in.	ft.in.	ft.in.	ft.in.	ft. in.	ft.in.	in. in.	
4	6-8	5- 9	4-0	3- 6	4-0	20	4- 5	3-11	11- 6	4- 2 15/16	2- 7⅜	12	5- 9⅛	3-3	6- 0	2- 2⅝	2-11½	5¼	2-4	2-4	7- 8	23½	2-6	32 x 12	400
5	7-6	6- 6	4-4	3- 8	4-8	2- 0	5- 0	4- 4	12- 6	4- 6⅜	2- 8⅞	14⅛	6- 1¼	3-9	7- 0⅞	2- 4⅛	3- 6¼	6¼	3-0	3 0	9- 6	2- 4	3-0	36 x 14	375
6	8-7	7- 4	5-0	4- 0	5-6	2-10	5- 8	4- 8	14- 2	4-10¾	2-10¾	15⅛	6- 7½	4-3	8- 1½	3- 0½	3- 9½	7⅛	3-4	3-4	10- 8	2- 6½	4-0	40 x 16	350
7½	10-8	7- 8	5-4	4- 5	6-2	3- 6	6- 1	5- 2	14-11	5- 6⅛	3- 1⅞	15½	7- 4	5-0	8- 7⅛	2-11¾	4- 4	10½	3-6	3-6	11-10	2- 9	4-8	44 x 19	350
8	12-4	9- 0	5-9	5-10	6-8	3-10	6-10	5- 9	15- 8	5- 9⅝	3- 6¼	16½	7-11	6-0	10- 5⅛	3- 6¼	4- 6	7	4-0	4-0	13- 0	3- 3	5-2	48 x 20	350
9	14-6	9-10	6-4	5- 5	7-8	4- 8	7- 6	6- 7	17- 0	6- 6½	3- 8¼	19 3/16	8- 6½	7-0	12-10	3-10	5- 6	9	4-6	4-6	14- 6	4- 0	6.0	56 x 20	300

NOTE—In all cases get special plan for foundation. The dimensions given on this page are only intended as a preliminary guide.

Plate 4901



STYLE "K" BREAKER—RIGHT ANGLE DRIVE

General Dimensions of Foundations—Timber Work.

RIGHT ANGLE DRIVE—TIMBER

No.	A	B	C	D	E	F	G	H	J	K	L	M	N	O	P	Q	Pulley	Revs. Per Min.
	ft.in.	ft. in.	ft.in.	ft.in.	in.	ft. in.	ft. in.	ft. in.	ft.in.	ft.in.	ft. in.	ft. in.	ft.in.	ft.in.	ft. in.	in.	in. in.	
4	6-8	5-9	4-0	3-0	12	5-9¼	4-2$^{15}/_{16}$	2- 7⅜	14-0	5-3	6-0	2- 2⅝	5-6	6-0	2-11½	5¼	32 x 12	400
5	7-6	6-6	4-8	3-8	14⅛	6-1¼	4-6⅜	2- 8⅞	16-0	5-9	7-0⅞	2- 4⅛	7-0	7-0	3- 6¼	6¼	36 x 14	375
6	8-7	7-4	5-6	4-6	15⅛	6-7½	4-10¾	2-10¾	16-0	6-3	8-1½	3- 0½	6-8	8-8	3- 9½	7⅛	40 x 16	350
7½	10-8	7-8½	6-2	4-10	15½	7-4	5-6⅛	3- 1⅞	18-0	6-9	8-7⅛	2-11¾	8-6	8-3	4- 4	10½	44 x 19	350
8	12-4	9-0	6-8	5-4	16½	7-11	5-9⅝	3- 6¼	18-0	7-3	10-5⅛	3- 6¼	9-6	9-4	4- 6	7	48 x 20	350

NOTE—In all cases get special plan for foundation. The dimensions given on this page are only intended as a preliminary guide.

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